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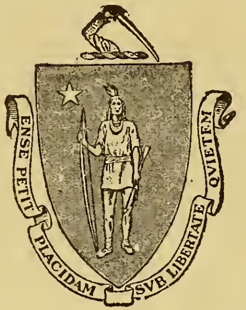

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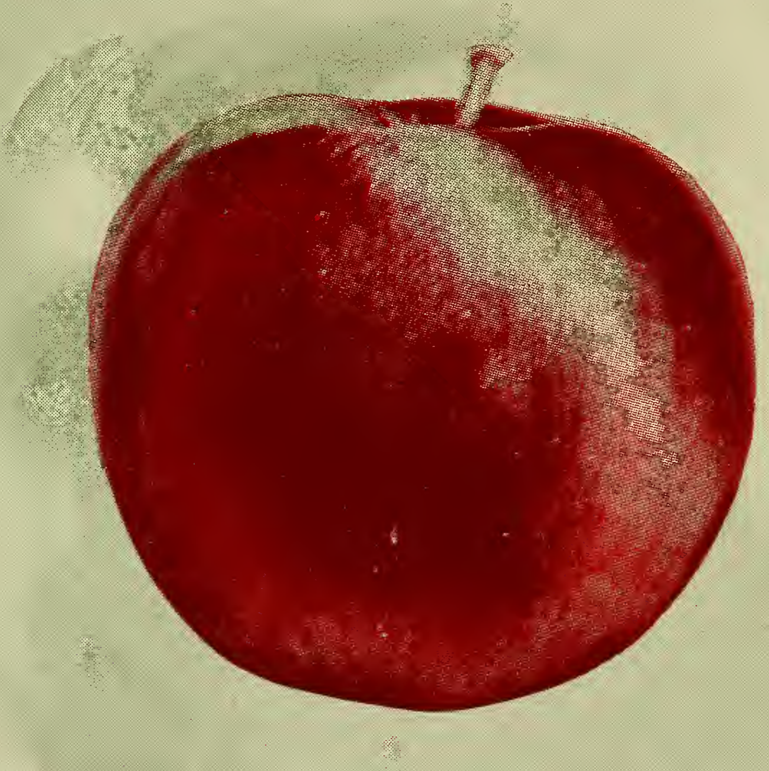
FERTILIZING



ORCHARD AND GARDEN

FERTILIZING THE ORCHARD AND GARDEN

(SECOND EDITION)

BY

B. LESLIE EMSLIE, P.A.S.I., F.C.S.

AND

WALTER SHIPLEY

PUBLISHED BY

DOMINION AGRICULTURAL OFFICES
OF THE POTASH SYNDICATE
1102-1105 TEMPLE BUILDING
TORONTO, ONT.

Fallawater Apples in the orchard of

W. H. STARR, Chipmans Corners, N.S.

Showing effects of thorough spraying and fertilizing.

Fertilizing Orchard and Garden

INTRODUCTION

IT is not intended that this booklet should form a complete guide to the practice of fruit growing, its main object being rather to throw some light on the question of feeding the plants, but a few hints may be given on general principles, whose observance is essential to successful horticulture.

The Orchard Site should be sloping or rolling land with good natural drainage; failing these natural conditions, artificial drainage must be resorted to, as no kind of fruit tree likes "wet feet."

The Soil is an important consideration. Apples will usually do well on soils varying from rich sandy-loam to clay-loam, while pears seem to thrive best on clay-loam or even heavy clay. Cherries and plums usually do best on medium loams. In the case of the former, good natural drainage is of the utmost importance. Peaches do not seem to be so particular in their choice of soil, if the climate is suitable. They will grow successfully, other necessary conditions provided, on soils varying from sandy to heavy clay-loam.

Choice of Varieties.—It is not generally considered advisable to plant many varieties. Two or three of the best commercial kinds, which are known to do well in that particular district, should be selected. The fewer the number of varieties the simpler will the operations of packing and marketing be.

Of course, it is sometimes desirable to plant fillers of other earlier maturing varieties of apples between the standard varieties, but these fillers should be removed before they commence to interfere with the root or head space of the standards.

To ensure fertilization of the flower, it is generally desirable to plant only 4 or 5 rows of one variety by itself, especially in the case of the Northern Spy and Gravenstein apples, which depend mostly on the pollen of other varieties for the fertilization of their own blossoms.

Preparation of Land for the Orchard.—It is a good practice when possible to grow potatoes or other hoed crops for one or two years on the land intended for the orchard, in order to give an opportunity for the killing of weeds and thorough cultivation of the soil. A good dressing of barnyard manure should also be given, together with an application of commercial fertilizer, which will ensure a readily available supply of plant food, so essential to the early growth and development of the young trees.

Distance Apart to Plant.—This depends on the kind of fruit to be planted and also to some extent on the varieties. The distance should be such that the trees will not interfere with each other when fully developed.

Generally speaking trees should be planted:—

Apples	40 feet apart.
Sour Cherries	20 feet apart.
Sweet Cherries	30 feet apart.
Standard Pears	20—25 feet apart.
Dwarf Pears	10—12 feet apart.
Peaches and Plums,	20—25 feet apart.

The following is useful as showing the number of trees contained on an acre of land at various distances apart, on the square system:—

10 ft. x 10 ft.	435	20 ft. x 20 ft.	109
10 ft. x 12 ft.	363	24 ft. x 24 ft.	75
10 ft. x 20 ft.	218	25 ft. x 25 ft.	70
12 ft. x 12 ft.	302	28 ft. x 25 ft.	55
12 ft. x 15 ft.	242	30 ft. x 30 ft.	48
15 ft. x 15 ft.	193	33 ft. x 33 ft.	40
16½ ft. x 16½ ft.	160	35 ft. x 35 ft.	35
18 ft. x 18 ft.	134	40 ft. x 40 ft.	27

Care of the Orchard.—This may be summed up in the operations of Pruning, Spraying, Cultivating and Fertilizing, or Feeding the Soil.

Pruning.—During the early years pruning should be most carefully and systematically carried out, the object being to produce a tree with a strong open top which will allow the free access of air and light.

Spraying.—There is now no doubt in the minds of any except the most ignorant of the value of spraying, and last year (1910) the effects in many sections were more noticeable than ever before. In many orchards where spraying experiments were conducted it made the difference between a paying crop and no crop at all.

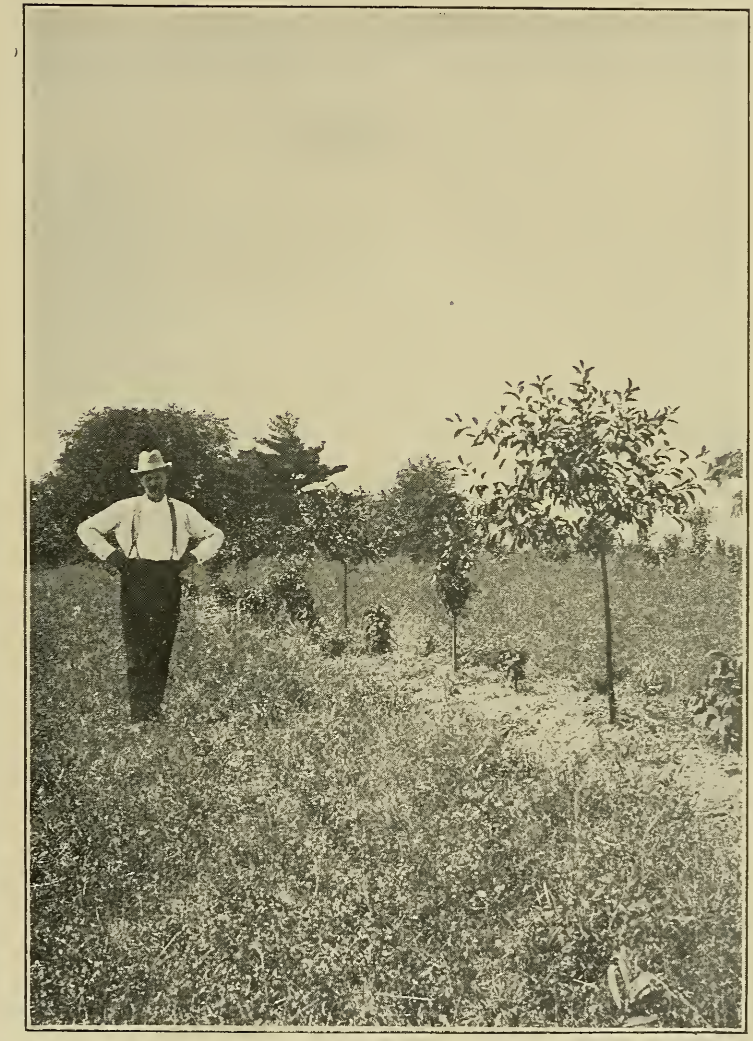
Many of the leading apple buyers have now decided to purchase only the product of orchards which have been systematically sprayed.

Cultivating.—Thorough cultivation is necessary to destroy weeds and aerate the soil. Until the trees approach full bearing, other crops may be grown between the rows. These may be small fruits, such as respberries, strawberries, currants and gooseberries. Potatoes or other hoed crops might also be grown. Personally, we do not favor an orchard on sod, believing that the soil of a cultivated orchard is better aerated, freer from insects, and that the trees are more easily and thoroughly nourished under the latter condition.

In the Ontario Horticultural Exhibition, held in
Toronto, November, 1910.

Products of Ontario Orchards and Gardens.

Orchard planted in May, 1908; Photographed in July, 1909.



Montgomery Cherry and Dwarf Duchess Pear planted alternately in the row, with Red Currant bushes between trees. Alfalfa growing between the rows, which are 20 feet apart.

The system of growing and plowing under cover crops of clover, as practiced in the Annapolis Valley orchards, cannot be improved upon. Besides supplying the necessary humus to the soil, the clover also supplies the valuable nitrogen, which it has the power of extracting from the atmosphere.

The question has frequently arisen of late as to the advisability of growing Alfalfa in the orchard.

The chief objection would be the difficulty of plowing down the crop, as the roots grow sturdily and penetrate to a great depth. There is no reason, however, why Alfalfa should not be grown for a few years in a young orchard, provided that the tree rows are kept cultivated to a width exceeding that of the spread of the branches. The deeply ramifying roots of the Alfalfa open up the soil, thus assisting drainage and aeration and consequently rendering plant food in the soil available. Since about one-half the nitrogen content of the Alfalfa plant is contained in the root, when the crop is eventually plowed under, a very valuable addition to the soil's humus and nitrogen content is obtained.

Fertilizing.—This subject is treated of in the following pages. It merits thorough consideration, for it is undoubtedly one of the chief factors in successful horticulture at the present day and, indeed, is very often the limiting factor, the neglect of which may spell failure.

NOTE.—In the next edition of this pamphlet, which will probably be prepared within the next twelve months, we hope to give the results of some fertilizer experiments from Canadian orchards, now under way. Some of the experiments are being conducted on orchards just coming into bearing, while the others have been conducted too short a time to justify, in our opinion, the publication of the results until another year's records have been added.

B. L. E.

THE ORCHARD

IT is still a common belief with a large number of orchardists that fruit trees do not require any special manuring. On a good average soil, most trees, even without any special manuring, will give fairly good returns for a few years, as, owing to the extensive root growth of fruit trees, the feeding area is much larger than for most crops. After exhausting the soil of its available ''plant food'' a tree is naturally unable to give any but small or even no returns for a year or so, until these elements are in some measure restored to the soil. This, no doubt, was the origin of the theory that fruit trees require a rest every few years. All up-to-date orchardists now recognize the fact that if profitable returns are wanted from the orchard the elements of fertility must, in some manner, be restored to the soil. When it is considered that the growth of fruit in an orchard is a continuous system of cropping and consequently even more exhaustive than ordinary mixed farming, it is not difficult to understand the need for fertilization. In this connection it might be interesting to quote from Professor Voorhees' ''Fertilizers'':—

''An experiment bearing upon this point is very instructive as indicating the need of manures for fruit trees, not only in reference to the amount removed but also in reference to the proportions of the constituent elements required. This study shews that the plant food contained in 20 acres of apples of 15 bushels per tree, and 35 trees per acre, and in the leaves for the same period, amounts to, in round numbers, 1,337 lbs. of Nitrogen, 310 lbs. of Phosphoric Acid and 1,897 lbs. of Potash. These amounts of plant food are compared with the amount that would be removed by 20 years' continuous cropping with wheat, assuming an average of 15 bushels per acre and 7 lbs. of

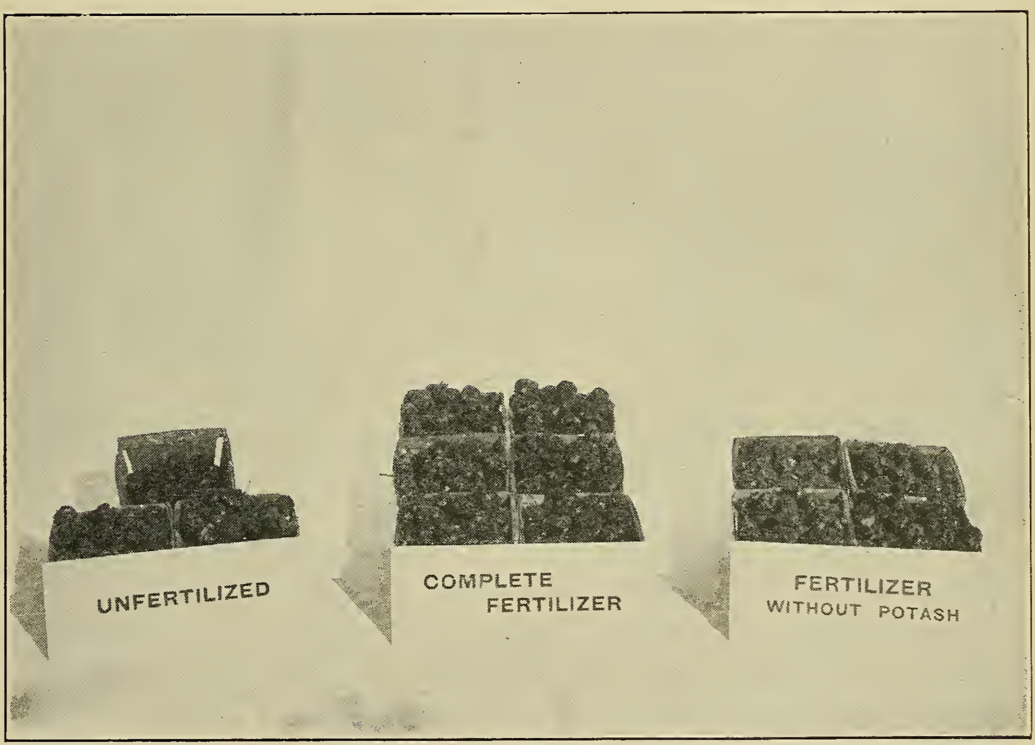
A well-kept orchard in the famous Annapolis Valley, owned by

J. ELLIOTT SMITH, Wolfville, N.S.

For many years Mr. Smith has been fertilizing his orchard with Bone Meal and Muriate of Potash. The Nitrogen is supplied by growing and ploughing in cover crops of clover.

Experiment on Strawberries, 1908.
Conducted by

EMSLIE BROS., Glengairn, Oakville, Ont.



Yield per acre..2,560 Baskets 6,144 Baskets 4,096 Baskets.

This experiment shows an increase of 2,048 baskets, directly due to the application of Potash.

straw to 3 bushels of grain, viz., 660 lbs. of Nitrogen, 211 lbs. Phosphoric Acid and 324 lbs. of Potash. By this comparison it is shewn that the 20 crops of apples remove more than twice as much Nitrogen, half as much again of Phosphoric Acid and nearly three times as much Potash as the 20 crops of wheat.''

If a tree is supplied with the necessary plant food ingredients, at the proper time and in easily available form, there is no reason why it should not continue to yield abundantly every year. In some seasons, of course, insect pests, weather conditions or other causes may occasion a partial or even a total failure. As a number of fruit growers do not fertilize their orchards, a few words on this subject may not prove uninteresting. Like all other plants, fruit trees, of whatever kind, utilize during their growth and maturity certain elements of fertility, commonly called ''plant foods.'' Only four of these need be considered by the orchardist, as an average soil contains a sufficient supply of the others. These are:—

Nitrogen—which acts as a stimulant, in large measure, to plant life and promotes the growth of leaf and wood.

Phosphoric Acid—which aids in the formation of blossoms and fruit.

Potash—which, when applied liberally, increases the yielding capacity of the tree, improves the quality of the fruit and lessens the liability to injury from frost and disease.

Lime—which, in conjunction with Potash, aids in the formation of hard, firm wood and also in fruit production. Lime is very important for fruits of the stone varieties, as it helps materially in the formation of the stones.

While these substances furnish the tree with the necessary plant-food ingredients, they do not supply the valuable humus to any great extent and for this reason a light dressing of barnyard manure, say of ten tons per acre, should be given, or cover crops of clover or some other legume plowed down every one or two years. Although barnyard manure contains all the elements necessary for the growth of fruit trees (though not in the proper proportions) its application cannot be recommended except for a young orchard. Owing to the large bulk required, barnyard manure is not easily applied to get the full benefit in a reasonable time. In order to supply the ingredients necessary for full bearing trees an application of 17 to 20 tons would have to be given. Experiments have proved, however, that quicker and more profitable returns can be got by the judicious use of artificial fertilizers in conjunction with barnyard manure or cover crops.

It is a regrettable fact that this subject has not received the attention in the Dominion that its importance demands. In fact, it would seem that so much has been said about the necessity for spraying that there is a danger of our forgetting that fruit trees need feeding as well as doctoring. An experiment, conducted by the Massachusetts Experiment Station for a period of 20 years (1889 to 1909) gives some interesting results, and below we give results of same in tabulated form:—

Massachusetts Experiment on Apples, 1889-1909.

(Treatment and yields per acre to date.)

	PLOT 1.	PLOT 2.	PLOT 3.	PLOT 4.	PLOT 5.
Annual Treatment.	Manure, 10 tons.	Wood Ashes, 1 ton.	Check.	Bone, 600 lbs; Muriate of Potash, 200 lbs.	Bone, 600 lbs.; Low Grade Sulphate of Potash, 400 lbs.
Present average girth .	37.25 in.	31.94 in.	27 in.	30.55 in.	35.54 in.
Ratios of girth	140-	118.4	100-	113-	131.5
Total yields, lbs. . . .	17288.5	10150	3354	10958.5	15971.75
Ratio of yields	515	301	100	327	476
Quality	No. 5	No. 1	No. 4	No. 3	No. 2

Packing "Spy" Apples in Orchard of

PORTER BROS., Appleby, Ont.

From this orchard of 6½ acres $1,100 were obtained for the crop of 1910, as a result of systematic spraying and fertilizing.

Photo taken in Orchard of

PORTER BROS., Appleby, Ont.

Sample of "Spys" from crop of 1910.

An extract from the Pennsylvania Experiment Station bulletin referring to this is as follows:—

"Here we have some very positive results from the application of fertilizers. In growth the trees of the treated plots show an increase of from 13 to 40 per cent. over the checks, and in yields they show benefits of 201 to 415 per cent. The quality of the fruit is also improved in all plots except that receiving barnyard manure, in which it is poorest. Manure, although most efficient in securing growth and yield, fails so completely on quality that it takes a relatively low rank in final value." The soil on which this experiment was conducted was a "moderately heavy gravelly loam with a moderately heavy clay sub-soil" and the varieties of apples used were Baldwin, R. I. Greening, Roxbury and Gravenstein.

Requirements of Fruit Trees.

Although all varieties of fruit trees require the same ingredients, the quantities and forms in which these can most profitably be applied vary with the different fruits. The age of the tree, also, in large measure determines its fertilizer requirements.

With young trees the object is to promote a large, healthy growth, while, in the case of a bearing orchard, it is well to remember that the object of fertilizing is to produce fruit and not wood. Except on poor, thin soils it is hardly necessary to fertilize apple and pear trees for a year or so after planting; and, as these trees come rather slowly to bearing, the slower acting forms of fertilizers, particularly Nitrogenous, can be very profitably used. For peaches, plums and cherries the fertilizer requirements are slightly different. The period of development of these trees, prior to bearing, is much shorter, and the cropping is perhaps even more exhausting than apples and pears. So that with these fruits the demands for plant food are proportionately greater in the early life of the tree and for this reason the more quickly acting forms of fertilizers are recommended. Nitrogen, especially in the form of Nitrate of Soda, should never be applied late in summer to a bearing orchard, because of its tendency to prolong growth and thus retard the ripening process. Where cover crops of clover, etc., are grown and plowed under as green manure, little or no extra Nitrogen will be required, and by this means also a supply of valuable humus is accumulated in the soil, thus doing away to a large extent with the necessity for using barnyard manure. Sulphate of Ammonia is also used as a source of Nitrogen, but it is usually slightly more expensive, not so quick in its action and, under average conditions, does not seem to give any better results than Nitrate of Soda.

Acid Phosphate, Basic Slag and Bone Meal are all used to supply the phosphoric acid to the orchard. Basic Slag and Bone Meal are somewhat slower in their action than Acid Phosphate, which makes them suitable for fall application, otherwise they all seem to give equally good results. The high percentage of Lime contained in Basic Slag has a very beneficial effect, especially on stone fruit trees. The prevailing practice in the world-famed Annapolis Valley is to apply Bone Meal (600 lbs.) and Muriate of Potash (300 lbs.) per acre in the fall. The Nitrogen is supplied by plowing down clover and other leguminous crops.

The chief sources of supply of Potash are Muriate and Sulphate of Potash. Wood ashes are sometimes used but, as their percentage of Potash is small and very variable, their application under average conditions is hardly to be recommended. Fertilizers are generally applied broadcast and well harrowed or lightly plowed in.

Under average conditions the following mixture should give satisfactory results:—

120 lbs. Nitrate of Soda.
400 lbs. Acid Phosphate or 400 lbs. Basic Slag or Bone Meal.
200 lbs. Muriate or Sulphate of Potash.

Where it is considered advantageous to fertilize each tree separately the following quantities would suffice per square yard of root area:—

½ oz. Nitrate of Soda.
2 oz. Acid Phosphate or 2 ozs. Basic Slag or Bone Meal.
1 oz. Muriate or Sulphate of Potash.

These quantities may be applied annually to orchards in full bearing, but for a young orchard the application will suffice for two years, generally speaking.

No hard and fast rule can, however, be given as to exact quantities of fertilizers to apply, as this depends largely on the age, size and fruit bearing capacity of the trees. So that it becomes necessary for the orchardist to experiment for himself in order to ascertain the requirements of his orchard. In conclusion, while orchards can undoubtedly be greatly improved by thorough cultivation, pruning and spraying, yet the most profitable returns can not be obtained unless the necessary supply of readily available ''plant food'' is present in the soil. There is quite a diversity of opinion as to when fertilizers can most profitably be applied to fruit trees. As they start their growth very early in spring, the fertilizers ought to be applied as soon after the frost is out of the ground as possible. Particularly is this the case in fertilizing a young orchard. Where fertilizers are being newly applied to a bearing orchard it must be borne in mind that, as a rule, little or no effect is visible until the second year after application.

* *

SMALL FRUITS

Small fruits do not differ materially in their plant food requirements from those already discussed. But as they are generally crops which have a much shorter preparatory period, and at most a comparatively few short years of bearing life, the method of fertilization is slightly different. In the case of the strawberry, where the preparatory period of growth is only one year, it is absolutely necessary to have a readily available supply of Potash and Phosphoric Acid in the soil in order that the plants may make a vigorous growth the first season. Except where the land has been left in a high state of cultivation from previous cropping, a good dressing of barnyard manure should be given to the strawberry bed in spring, supplemented by an application of readily available Potash and Phosphoric Acid to enable the plant to grow strong and healthy before winter sets in. If the soil is in good condition before planting out the beds, the application of the fertilizers can be delayed until the spring following, when the Potash, Phosphoric Acid and half of the Nitrogen should be applied in order to promote a strong, early growth and a better setting of fruit. The balance of the Nitrogen is perhaps better applied just after the plants blossom; if applied later it has a tendency to retard ripening and to produce soft berries, which do not ship well. When Nitrate of Soda is used as the source of Nitrogen, and it is usually preferred on account of its becoming so quickly available, it must never be applied when the leaves are wet with dew or rain.

With most of the other small fruits, raspberries, currants, grapes, etc., the special need is for Potash and Phosphoric Acid, although an application of Nitrogenous fertilizer in spring helps to produce the strong, early growth so much desired. As with all other crops, the amounts of fertilizer that can profitably be applied depend on the condition of the soil, its previous cropping, etc.

Under all average conditions the following quantities of fertilizer per acre would give satisfactory returns:—

Strawberries.

150 to 200 lbs. Nitrate of Soda.
400 lbs. Acid Phosphate.
200 lbs. Sulphate of Potash.

Grapes, Raspberries, etc.

100 to 120 lbs. Nitrate of Soda.
400 lbs. Acid Phosphate.
200 lbs. Sulphate of Potash or Muriate of Potash.

W. S.

* *

FERTILIZING THE GARDEN

BY

B. LESLIE EMSLIE

P.A.S.I., F.C.S., ETC.

An Article which appeared in
THE CANADIAN HOME JOURNAL
of April, 1910

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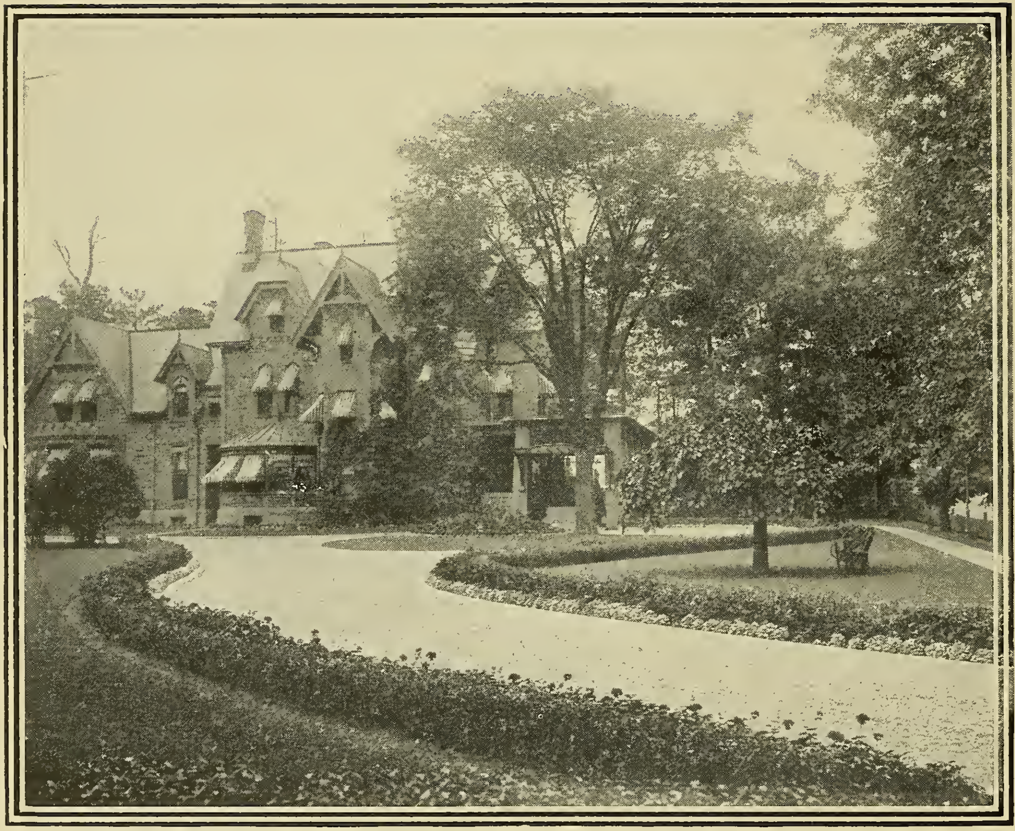


Fertilizing the Garden

By B. Leslie Emslie, P.A.S.I., F.C.S., Etc.

(Reprinted by permission of "The Canadian Home Journal," Toronto.)

IN view of the important role which commercial fertilizers now play in general farming and fruit growing it is intended to give within the scope of this article a few hints regarding their application in the house garden. The benefit to be derived from a judicious use of fertilizers on fruit and vegetables is no longer problematical, for their employment has long since passed the experimental stage.

The substances which we have to consider in fertilizing are Potash, Phosphoric Acid and Nitrogen, these being those of which soils become depleted by the growth of plants. One exception must be noted, however: those plants belonging to the natural order Leguminosae (Peas, Beans, Clover, Alfalfa, etc.) have the power of abstracting the free nitrogen of the air, so that not only do these plants obtain sufficient nitrogen for their own development, but leave behind them, in their decaying remains, a supply for those plants which succeed. While the legumes have no difficulty in obtaining their nitrogen, they require liberal supplies of the minerals, Potash and Phosphoric Acid. Besides the three substances aforementioned, a fourth, Lime, must be added. This should be applied to the soil at intervals of from four to six years. It is only to a very small extent a plant food, but tends rather to sweeten the soil.

The intelligent use of commercial fertilizers not only increases the bulk of vegetables but also improves their quality as compared with those which have received excessive application of stable manure, and, what is probably of primary importance, hastens their maturity. Likewise, Potash and Phosphoric Acid promote fruit setting on the trees, produce sound, durable wood and well colored fruit with good flavor and keeping qualities. The Nitrogen favors the growth of the foliage and gives size to the individual fruits. Potash, Nitrogen and Lime influence the development of leaf in color and size of cabbage and other leafy plants. For flowering plants Potash and Phosphoric Acid are of great importance in the production of flowers with brilliant color and scent, while the application of Nitrogen contributes to the size of the flower and to the growth of stem and leaf. In the production of large fine blooms on strong stems, Potash and Phosphoric Acid ought to be liberally used, while Nitrogen should be applied cautiously, since an excess of the latter would promote the growth of stems and leaf at the expense of the flower.

While the excessive and indiscriminate use of stable manure in the garden is to be avoided, still an occasional application at intervals of from two to four years is recommended, since it tends to keep the soil in a loose, friable condition and increases the temperature of the same. The chief objections to its too frequent use are that it may cause a too rank and coarse growth, besides introducing troublesome weed seeds.

Some of the chief fertilizers carrying Potash, Phosphoric Acid and Nitrogen are:—

Potash	Muriate of Potash, Sulphate of Potash.
Phosphoric Acid	Acid Phosphate, Basic Slag, Bone Meal.
Nitrogen	Nitrate of Soda, Sulphate of Ammonia. Dried Blood.

Circumstances will determine the choice of the source of each plant food ingredient, but for spring application the more soluble are usually to be preferred. The Potash Salts, Sulphate and Muriate, are equally available: the Phosphoric Acid in Acid Phosphate is more soluble than in Basic Slag or Bone Meal and the Nitrogen in Nitrate of Soda is much more soluble than in Dried Blood, Sulphate of Ammonia, in this respect, being intermediate between the two. It may be mentioned here that Sulphate of Potash is suitable for all plants, but Muriate of Potash is not so desirable for potatoes, small fruits and flowers, so that in the garden the Sulphate may be used exclusively as a source of Potash. As a general rule, the fertilizer may be broadcasted and on no account should they be concentrated directly under the roots of the plants. The Potash and Phosphate should be thoroughly mixed together and applied in early spring, but Nitrate of Soda should be withheld until growth has fairly commenced; it is even desirable in many cases to apply it in two applications, with an intervening perod of from two to three weeks, on account of its great solubility.. If Dried Blood is used as the source of Nitrogen, being slow in its action, it may be mixed and applied with the other fertilizers. Nitrogen is readily washed out of the soil but Potash and Phosphoric Acid are firmly retained, so that the latter may be applied in the fall of the year with good results.

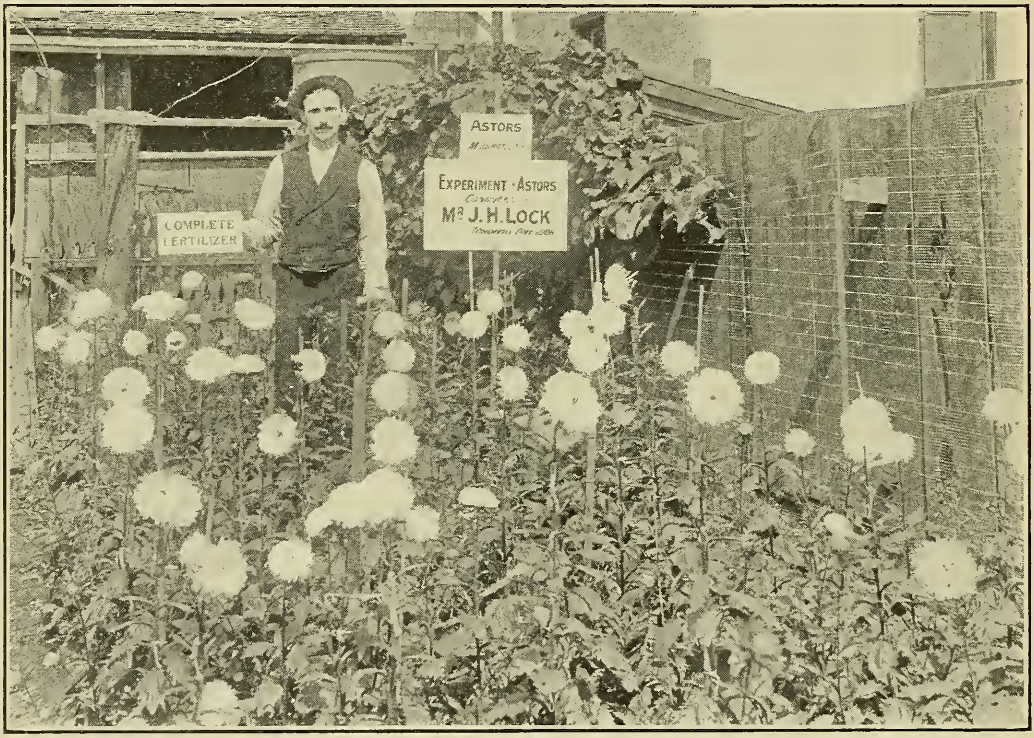
The following are a few prescriptions for various plants:—

Fertilizer for the lawn—

	Per Sq. Yard	Per Acre
Sulphate of Potash...........	½ ounce	150 lbs.
Acid Phosphate	1⅓ "	400 "
Nitrate of Soda..............	½ "	150 "
Total..................	2⅓ "	700 "

Experiments on "Asters" in 1908.
Conducted by

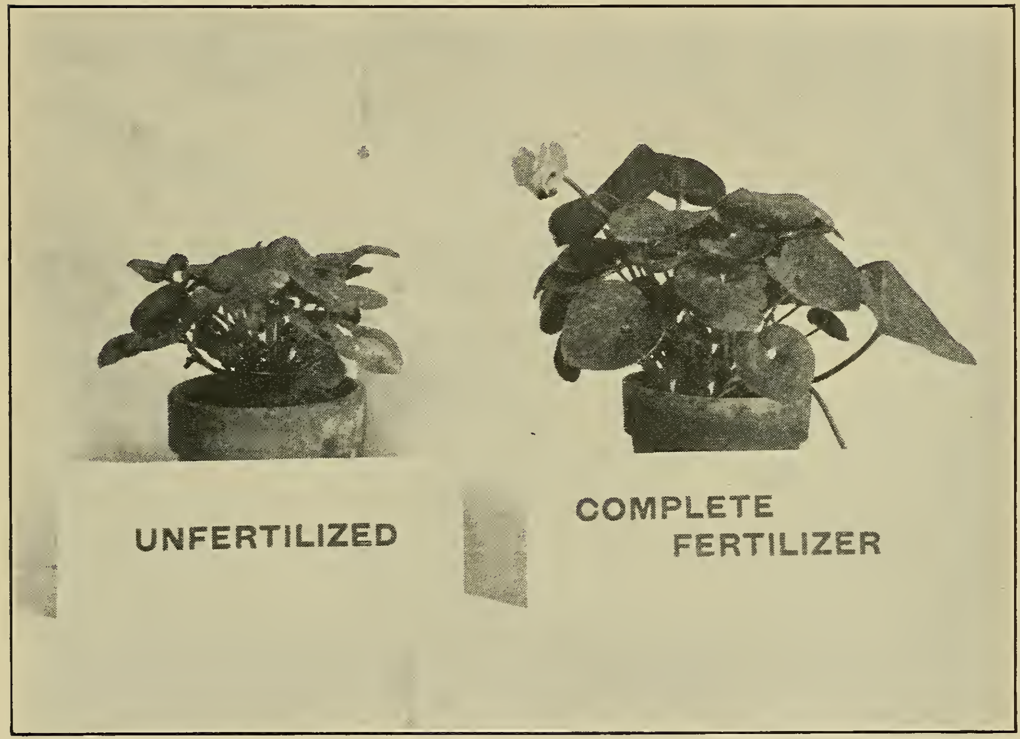
J. H. LOCK, 41 Manchester Ave., Toronto, Ont.



This photograph shows the plot to which the complete fertilizer was applied.

The cut on the right-hand cover is taken from a photograph of a first-prize Aster at the Canadian National Exhibition, Toronto, grown by Mr. Lock with the aid of a "complete fertilizer."

Experiment on "Cyclamen."
Conducted by
OTTO HEROLD, Waterloo, Ont.



Showing effect of a fertilizer containing a large percentage of Potash.

Fertilizer for Flowers—

	Per Sq. Yard	Per Acre
Sulphate of Potash	⅔ ounce	200 lbs.
Acid Phosphate	1⅓ “	400 “
Nitrate of Soda	½ “	150 “
Total	2½ “	750 “

Fertilizer for Cabbage—

	Per Sq. Yard	Per Acre
Sulphate of Potash	1 ounce	300 lbs.
Acid Phosphate	1⅔ “	500 “
Nitrate of Soda	1 “	300 “
Total	3⅔ “	1,100 “

Fertilizer for Celery, Onions, Cauliflower, Lettuce, Spinach, etc.—

	Per Sq. Yard	Per Acre
Sulphate of Potash	⅔ ounce	200 lbs.
Acid Phosphate	1⅓ “	400 “
Nitrate of Soda	⅔ “	200 “
Total	2⅔ “	800 “

Fertilizer for Peas and Beans—

	Per Sq. Yard	Per Acre
Sulphate of Potash	½ ounce	150 lbs.
Acid Phosphate	1⅓ “	400 “
Total	1⅚ “	550 “

Fertilizer for Beets, Carrots, Parsnips and Other Roots—

	Per Sq. Yard	Per Acre
Sulphate of Potash	½ ounce	150 lbs.
Acid Phosphate	1⅔ "	500 "
Nitrate of Soda	½ "	150 "
Total	2⅔ "	800 "

Fertilizer for Potatoes and Small Fruits—

	Per Sq. Yard	Per Acre
Sulphate of Potash	⅔ ounce	200 lbs.
Acid Phosphate	1⅓ "	400 "
Nitrate of Soda	½ "	150 "
Total	2½ "	750 "

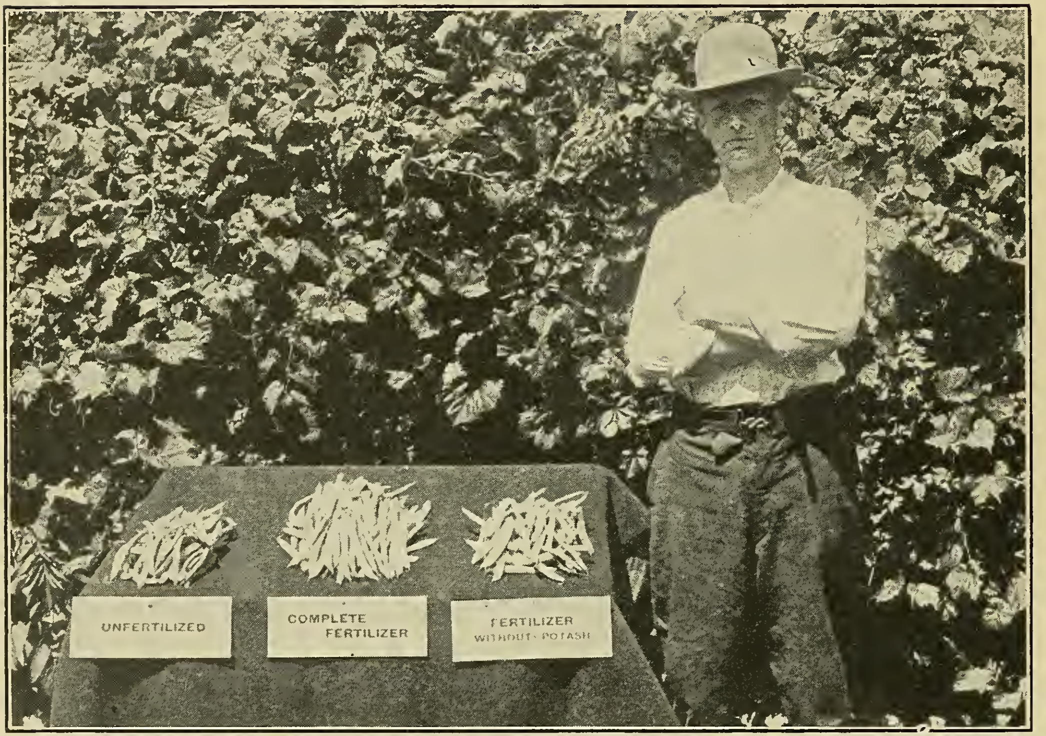
This mixture would also be suitable for Fruit Trees in bearing, but for young trees the Nitrate of Soda might be increased to 200 lbs. per acre and the Potash reduced to 150 lbs. per acre. The quantities given in these prescriptions are such as would be required under average conditions but in some cases they could be increased by 25 to 50 per cent. with profit and without danger of detrimentally affecting the plants.

A more complete treatise of this subject is contained in a booklet entitled "Artificial Fertilizers; Their Nature and Use," written by the author of this article, and copies may be obtained by addressing him at 1105 Temple Building, Toronto.

* * *

Experiment on Wax Beans, Conducted by

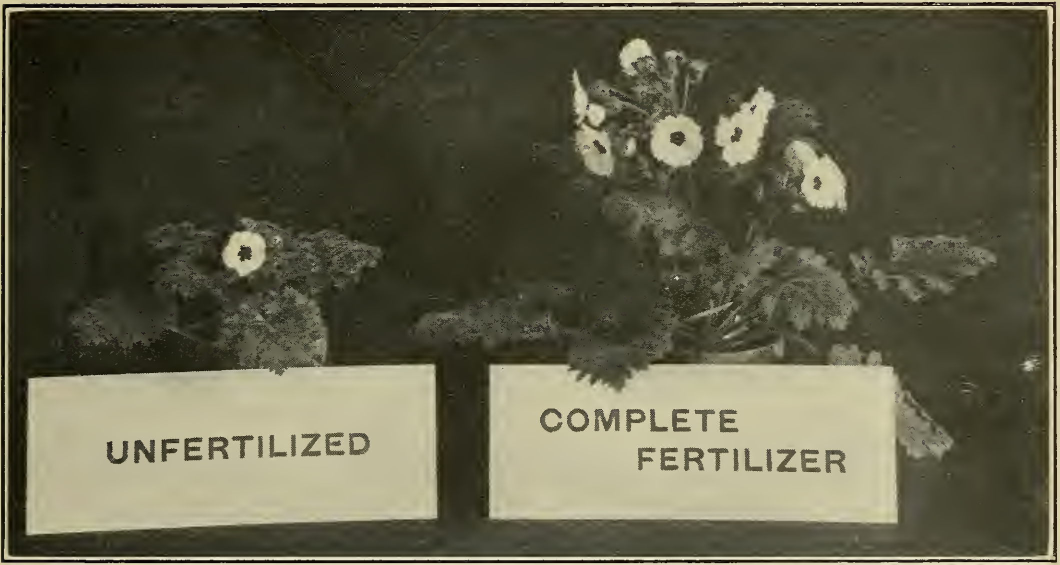
V. G. HECTOR, Erindale, Ont.



Yield per acre.	702 Baskets	1,194 Baskets	738 Baskets

Experiment on "Primula,"
Conducted by

OTTO HEROLD, Waterloo, Ont.



Showing effect of a fertilizer containing a large percentage of Potash.

Further copies of this Bulletin as well as of other Publications, such as:

"The Potato Crop in Canada;"

"The Farmer's Companion;"

"Artificial Fertilizers: Their Nature and Use" (Second Edition);

"The Importance of Potash in the Culture of the Sugar Beet;"

"The Improvement of Poor Permanent Pasture;"

"The Principles of Soil Fertility Applied to the Worn-Out Dyked Lands;"

"The After Effects of Fertilizers or Potash for Tobacco and Tomatoes;"

"An Experiment with Fertilizers;"

"Records of Fertilizer Experiments;"

"The Fertilizing of Hay and Grain Crops;"

"Fertilizing Root Crops and Vegetables," etc., etc.

Also Publications in French and German may be obtained FREE on application to

THE DOMINION AGRICULTURAL OFFICES OF THE POTASH SYNDICATE,

1102-1105 Temple Building, Toronto.

FERTILIZING

ORCHARD AND GARDEN

FERTILIZING TOBACCO

FERTILIZING TOBACCO.

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Fertilizing Tobacco.

TOBACCO is a rank, rapid growing, and heavy-feeding plant, and requires liberal supplies of plant food. The careful experiments of Dr. Goessman, of the Massachusetts (U. S. A.) Experiment Station, and of Prof. Stockbridge, of the Florida Experiment Station, furnish information of great practical value to the planter.

As a result of these investigations, the quantities of Phosphoric Acid, Nitrogen and Potash per acre, suggested by these two authorities, are as follows:

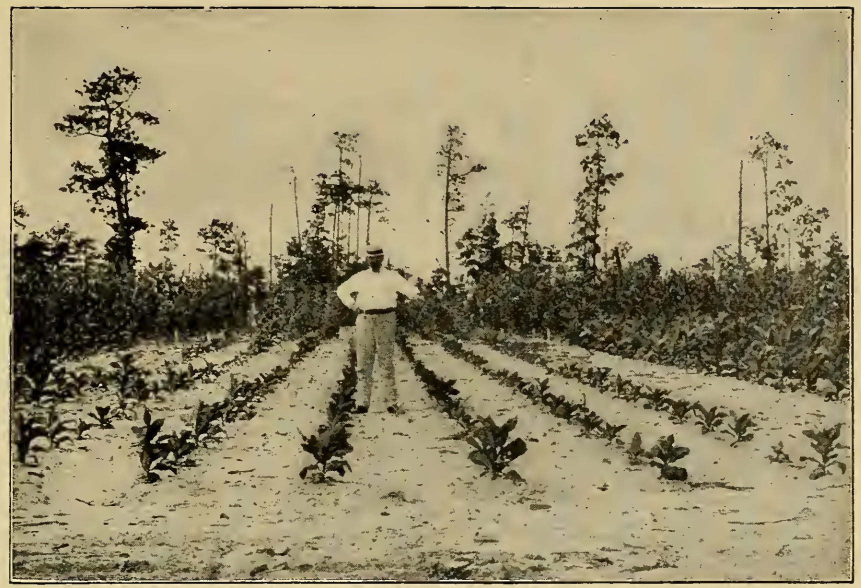
	PHOSPHORIC ACID	NITROGEN	POTASH.
Dr. Goessman,	60 lbs.	100 lbs.	300 lbs.
Prof. Stockbridge,	73 lbs.	180 lbs.	300 lbs.
Average per acre,	67 lbs.	140 lbs.	300 lbs.

A mixture of 600 lbs. of high-grade Sulphate of Potash, (96%), 850 lbs. of Nitrate of Soda and 550 lbs. of Acid Phosphate (12%) would just about furnish the amounts of Phosphoric Acid, Nitrogen and Potash mentioned above.

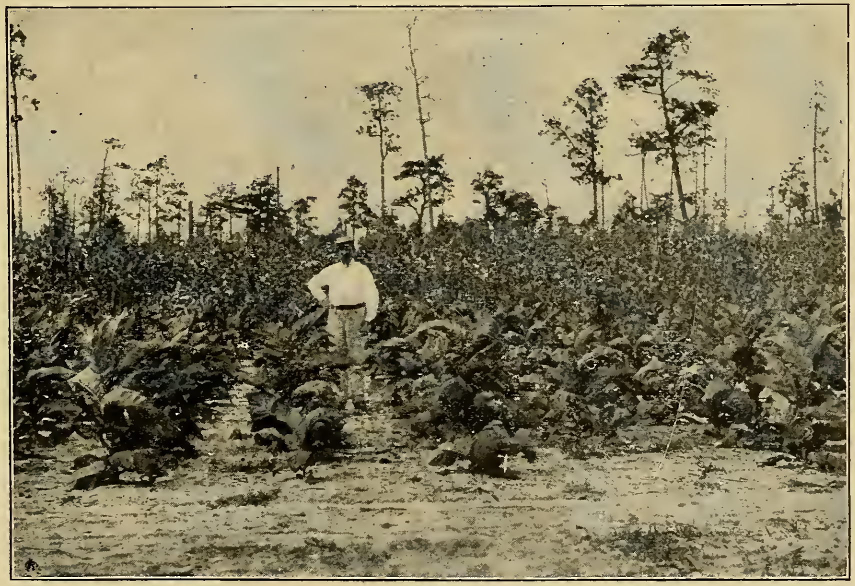
The plant food found by chemical analysis in the tobacco plant, furnishes a fair guide in determining the kind and amount of fertilizer to use. Of course, not only the leaf, but the whole plant must be accounted for in figuring out the actual plant food taken up. While the leaf is the object of tobacco growing, the leaf cannot be that is, 5% of Ammonia, 9% Potash and 4% Available Phosphoric Acid, which is a well balanced mixture for tobacco, the following materials can be used to make a ton.

Cotton Seed Meal, . .	1100 lbs.
Sulphate of Potash (96%),	350 lbs.
Acid Phosphate, . .	550 lbs.
	2000 lbs.

As to the amount of the above mixture to be applied per acre, this varies in different countries. On an average, though, from 1000 to 1500 lbs. per acre could be used to advantage. In Connecticut, the tobacco planters as a rule, use as much as 3000 lbs. per acre of a fertilizer of even higher grade than that above recommended. A little experimenting on the part of each planter, however, will soon indicate the amount which can be used with the greatest profit.



TOBACCO UNFERTILIZED. EXPERIMENT FARM, SOUTHERN PINES, N. C.



TOBACCO. FERTILIZED WITH POTASH, PHOSPHORIC ACID AND NITROGEN (COMPLETE FERTILIZER)—EXPERIMENT FARM, SOUTHERN PINES, N. C.

Composition of Fertilizer Materials Used as Sources of Nitrogen.

	Nitrogen. Per Cent.	Equivalent in Ammonia. Per Cent.	Potash (K_2O.) Per Ct.	Phosphoric Acid Total. Per Cent.
Nitrate of Soda	15 to 16	18 to 19½	......	....
Sulphate of Ammonia	19 “ 22	23 “ 26	.....	....
Dried-Blood (high grade)	12 “ 12½	14½ “ 17½	......	....
Dried-Blood (low grade)	10 “ 11	12 “ 14½	......	3 to 5
Concentrated Tankage	11 “ 14½	13½ “ 15	......	1 “ 2
Tankage	5 “ 6	6 “ 7½	......	11 “ 14
Tankage	7½ “ 9	9 “ 11	......	8½ “ 10½
Dried Fish Scrap	9½ “ 11	11½ “ 13½	......	6 “ 8
Cotton Seed Meal	6½ “ 7½	8 “ 9	1½%	2%
Castor Pomace	5 “ 6	6 “ 7½	1%	2%
Tobacco Stems	2 “ 3	2½ “ 4	5 to 8	about 1%

Composition of Fertilizer Materials Used as Sources of Phosphoric Acid.

	Nitrogen. Per Ct.	Equivalent in Ammonia. Per Ct.	Potash (K_2O.) Per Ct.	Phosphoric Acid.		
				Total. Per Ct.	Available Per Ct.	Insoluble Per Ct.
So. Carol'a Phos. Rock	......	......	......	26 to 27	....	26 to 27
So. Carolina Acid Phosphate	......	......	......	13 “ 16	12 to 15	1 “ 3
Florida Land Rock	.....	......	......	33 “ 35	....	33 “ 35
Florida Pebble Phosphate	......	......	......	26 “ 32	....	26 “ 32
Florida Acid Phosphate	......	......	......	14 “ 19	13 to 16	1 “ 3
Tennessee Phosphate	......	......	....	34 “ 39	....	34 “ 39
Tennessee Acid Phosphate	......	......	.....	14 “ 19	13 to 16	1 “ 3
Bone-Black (spent)	......	......	......	32 “ 35	......	32 “ 35
Bone-Black (dissolved)	......	.....	......	17 “ 19	16 to 17	1 “ 2
Bone-Meal	2½ to 4½	3 to 5½	......	20 “ 25	5 “ 8	15 “ 17
Bone (dissolved)	2 “ 3	2½ “ 3½	......	15 “ 17	13 “ 15	2 “ 3
Peruvian Guano	6 “ 10	7¼ “ 12	1½ to 4	10 “ 15	.. 8	2 “ 7

Composition of Fertilizer Materials Used as Sources of Potash.

	Pure Potash (K_2O.) Per Ct.	Lime Per Ct.	Nitrogen Per Ct.	Ammonia Per Ct	Phosp'ric Acid, Total, Per Cent.	Chlorine Per Cent.
Muriate of Potash....	50	......	......	....	... .	45 to 48
Sulphate of Potash (high grade).......	50to55	......	......	....	....	0.3 “ 1.5
Sulphate of Potash Magnesia.........	27 “30	0 85	......	... .	....	1.5 “ 2.5
Carbonate of Potash Magnesia..........	18½	.....	......	....	....	....
Kainit..............	12½	1.12	......	....	....	30 “ 32
Manure Salt	20	.....	......	....	....	40 “ 45
Cotton-Seed-Hull Ashes.............	20 “30	10	......	....	7 to 8	....
Nitrate of Potash or Saltpeter..........	43 “45	.....	13to14	16 to 17	....	....
Wood-Ashes (unleached)...........	2 “8	30to55	......	....	1 to 2	....
Wood-Ashes (leached)	1 “2	35 “40	......	......	1 to 1½	....
Tobacco Stems	5 “8	3.5	2 to 3	2½ to 3½	... ..	....

Average Composition of the Most Important Farm Manures.

FARM MANURES.	Nitrogen Per Ct.	Equivalent in Ammonia Per Ct.	Potash (K_2O) Per Ct.	Phosphoric Acid Total Per Ct.	Lime (CaO) Per Ct.
Cow-Manure (fresh)...	0.34	0.41	0.40	0.16	0.31
Horse-Manure (fresh)..	0.58	0.70	0.53	0.28	0.21
Sheep-Manure (fresh) .	0.83	1.00	0.67	0.23	0.33
Hog-Manure (fresh)...	0.45	0.54	0.60	0.19	0.08
Hen-Dung (fresh).....	1.63	1.98	0.85	1.54	0.24
Mixed Stable Manure..	0.50	0.60	0.63	0.26	0.70

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